

AD-A045 901

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS F/G 12/1
EFFECTS AND DETECTION OF SELECTIVE MODIFICATIONS IN SAMPLES: MU--ETC(U)
OCT 77 N L JOHNSON DAAG29-74-C-0030

UNCLASSIFIED

ARO-11959.17-M

NL

1 OF 1
ADA
045901



END
DATE
FILMED
11-77
DDC

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS
BEFORE COMPLETING FORM

1. REPORT NUMBER 19 11959.17-M	2. GOVT ACCESSION NO. 11 ARO	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Effects and Detection of Selective Modifications in Samples: Multivariate Models and Techniques.		5. TYPE OF REPORT & PERIOD COVERED Final Report, 7/1/74 - 6/30/77
7. AUTHOR(s) N.L. Johnson Principal Investigator		8. CONTRACT OR GRANT NUMBER(s) 15 DAAG29-74-C-0030
9. PERFORMING ORGANIZATION NAME AND ADDRESS Department of Statistics University of North Carolina Chapel Hill, NC 27514		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 11 3 act 77
11. CONTROLLING OFFICE NAME AND ADDRESS Army Research Office Research Triangle Park, NC		12. REPORT DATE 10/3/77
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) 9 Final rept. 1 Jul 74 - 30 Jun 77		13. NUMBER OF PAGES 4
		15. SECURITY CLASS. (of this report)
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Mathematical models
Sampling techniques
Censoring
Multivariate analysis

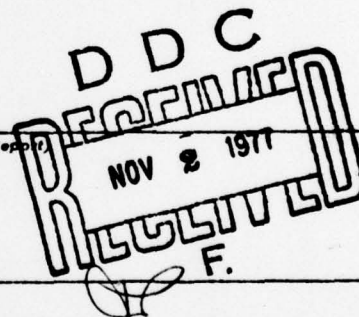
Population(statistics)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The study of tests of censoring of extreme sample values has been the major research topic. In contrast to earlier work, aimed at evaluating the effect of using specific inaccurate estimates of population distributions, attention has been concentrated on finding how little information suffices to make tests feasible. In particular, it has been found that one complete sample, of size comparable to that of a suspected incomplete sample, and known to be from the same population, makes possible a fairly powerful test. Even when it is only known that some samples, out of two or more, are complete, it is possible to construct useful tests. The work was also concerned with extreme values,

and the use of order statistics in estimating ratios - a technique which can also be applied to censored samples.
DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE
182 850
Unclassified applied to censored samples
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

ADA 045901

DDC FILE COPY



EFFECTS AND DETECTION OF SELECTIVE MODIFICATIONS
IN SAMPLES: MULTIVARIATE MODELS AND TECHNIQUES

N.L. Johnson
Principal Investigator

Final Report
September 1977

U.S. ARMY RESEARCH OFFICE
Research Triangle Park, N.C.

DAAG29-74-C-0030

UNIVERSITY OF NORTH CAROLINA

APPROVED FOR PUBLIC RELEASE:
DISTRIBUTION UNLIMITED.

FINAL REPORT ON "Effects and Detection of Selective Modification in Samples:
Multivariate Models and Techniques"

PARTICIPATING SCIENTIFIC PERSONNEL

Norman L. Johnson, Principal Investigator	1974-7
Joseph J. Walker (Ph.D. 1976)	1974-5
Carlos B. Segami (Ph.D. 1976)	1974-6
S. Lynne Stokes (Ph.D. 1976)	1974-6
C.F. Hsu (Ph.D. 1977)	1975-7
Marva H. Moore	1977
Helen P. Bhattacharyya	1976-7
Robert N. Rodriguez	1976-7
Douglas Hawkins	1976-7

The study of tests of censoring of extreme sample values has continued to be a major research topic of the Principal Investigator. In contrast to earlier work, aimed at evaluating the effect of using specific inaccurate estimates of population distributions, attention has been concentrated on showing how little information suffices to make tests feasible. In particular, it has been found [3] that one complete sample, of size comparable to that of a suspected incomplete sample, and known to be from the same population, makes possible a fairly powerful test. Even when it is only known that some samples, out of two or more, are complete, it is possible to construct useful tests [18].

The work of Hawkins [16] is also concerned with extreme values, and Bhattacharyya [1] discusses the use of order statistics in estimating ratios - a technique which can also be applied to censored samples.

In collaboration between S. Kotz and the Principal Investigator, the following research results have been obtained.

(i) Generalizations of the Farlie-Gumbel-Morgenstern distributions, both to a general number of variables [5] and by iteration to construct new systems [6], [7].

(ii) New multivariate distributions associated with generalized occupancy

models have been developed [8], [11].

(iii) A new model for hierarchal (multi-stage) replacement from an aging supply has been formulated and relevant methods of analysis indicated [19].

Segami [21] has studied systems of distributions which are "dual" to each other, in the way that Poisson and gamma distributions are related.

Using methods similar to those employed earlier by S. Kotz and the Principal Investigator in discussing power transformations of gamma variables, Rodriguez [13] has given an exhaustive summary of the Burr Type XII distributions.

Walker [23] has solved some distributional problems arising in cluster analysis.

The Principal Investigator's work on tests for mixtures has been systematically extended to a much broader field by Hsu [20] who enumerates 25 classes of problems and gives detailed analyses for about five of these classes.

Stokes [22] has explored the consequences of using rank-order sampling. This is a technique for using relatively cheap observations to help decide which individuals should be subjected to relatively expensive forms of measurements. Stokes also considered modifications of the technique, and its applicability to measures of dispersion as well as location (to which it had previously been restricted).

ACCESSION for	
NTIS	White Section <input checked="" type="checkbox"/>
DDC	Buff Section <input type="checkbox"/>
UNANNOUNCED	<input type="checkbox"/>
JUSTIFICATION _____	
BY _____	
DISTRIBUTION/AVAILABILITY CODES	
Di	SPECIAL
A	

PUBLICATIONS

- [1] Bhattacharyya, Helen P. Non-parametric estimation of rates of scale parameters, *Journal of the American Statistical Association*, 72, 459-463 (1977).
- [2] Johnson, N.L. A return to repetitions, *Ogawa 60th Birthday Volume* (Ed. S. Ikeda et al) (pp. 635-644), Tokyo: Shinko Tsusho. (1976).
- [3] Johnson, N.L. Completeness comparisons among sequences of samples, *H.O. Hartley 65th Birthday Volume* (Ed. H.A. David) (pp. (1977)).
- [4] Johnson, N.L. Approximate relationships among estimators of mortality probabilities, *Biometrics*, 33, 542-545, (1977).
- [5] Johnson, N.L. and Kotz, S. On some generalized Farlie-Gumbel-Morgenstern distributions, *Communications in Statistics*, A4, 415-427 (1975).
- [6] Johnson, N.L. and Kotz, S. On some generalized Farlie-Gumbel-Morgenstern distributions. II. Regression, correlation and further generalizations, *Communications in Statistics*, A6, 485-496 (1977).
- [7] Johnson, N.L. and Kotz, S. Propriétés de dépendence des distributions itérées, généralisées, à deux variables Farlie-Gumbel-Morgenstern, *Comptes Rendus de l'Académie des Sciences, Paris*, 285, (1977).
- [8] Johnson, N.L. and Kotz, S. Two variants of Pólya's urn models, *American Statistician*, 30, 186-188 (1976).
- [9] Johnson, N.L. and Kotz, S. Urn models: A useful tool in applied statistics, *Proceedings, Symposium on Applied Statistics* (Ed. P.R. Krishnaiah), Wright State University, Dayton, Ohio (1976).
- [10] Johnson, N.L. and Kotz, S. A vector-valued multivariate hazard rate, *Journal of Multivariate Analysis*, 5, 53-66 (1975).
- [11] Johnson, N.L. and Kotz, S. On a multivariate generalized occupancy model, *Journal of Applied Probability*, 13, 392-399 (1976).
- [12] Johnson, N.L. and Leone, F.C. Recovery of inter-block information in balanced incomplete block experiments, *Journal of Quality Technology*, 9, (1977).
- [13] Rodriguez, R.N., A guide to the Burr Type XII distributions, *Biometrika*, 64, 129-134 (1977).
- [14] Stokes, S. Lynne Ranked set sampling, *Communications in Statistics*, A6 (1977).

TECHNICAL REPORTS

- [15] Chand, N. An invariant sequential test for zero drift based on first passage time in Brownian motion, *Mimeo Series No. 987* (1975).
- [16] Hawkins, D.M. Testing a normal sample for multiple outliers, *Mimeo Series No. 1094* (1976) (submitted for publication in *Journal of the Royal Statistical Society*).
- [17] Johnson, N.L. Extreme sample censoring problems with multivariate data, I. *Mimeo Series No. 1010* (1975).
- [18] Johnson, N.L. Completeness comparisons among sequences of samples II. Censoring from above and below, and general censoring, *Mimeo Series No. 1103* (1977) (submitted for publication in *Journal of Statistical Planning and Inference*).
- [19] Johnson, N.L. and Kotz, S. Models of hierarchical replacement, *Mimeo Series No. 1126* (1977) (submitted for publication in *Mathematics of Operations Research*).

[*Mimeo Series* \equiv Institute of Statistics, University of North Carolina, *Mimeo Series*.]

Ph.D. THESES

- [20] C-F. Hsu: Tests for finite mixtures of distributions (1977).
- [21] C.B. Segami: Power series distributions: A dual class and some extensions (1976).
- [22] S. Lynne Stokes: An investigation into the consequences of ranked set-sampling (1976).
- [23] J.J. Walker: Some statistical procedures based on distances (1976).